Precalc Warm Up # 3-1

Solve

1. $(5 - 2x)(3 - 4x) \leq 0$

2. $3x^2 + 5x > 2$

3. Find the distance (exact) between the points of intersection of the line $y = 3x + 1$ and the parabola $y = x^2 + 4x - 5$

HW Questions?

EXERCISES 2.4.3

1. Find the solution set for each

(a) $(x-1)(x+2) > 0$

(b) $(x+3)(x-2) \leq 0$

(c) $x(4-x) \leq 0$

2. Find the solution set for each

(a) $x^2 + 3x + 2 > 0$

(d) $x^2 - 4 \leq 0$

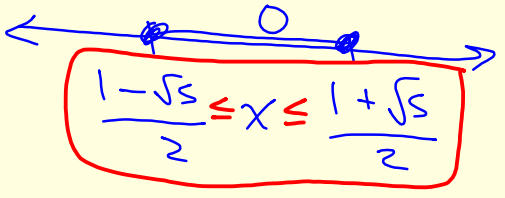
(g) $-x^2 + x + 1 \geq 0$ → $x^2 - x - 1 \leq 0$

(j) $x^2 - 4x + 3 < 0$

(m) $-x^2 - 2 > 0$

$$x = \frac{1 \pm \sqrt{1 - 4(1)(-1)}}{2}$$

$$x = \frac{1 \pm \sqrt{5}}{2}$$



$$\frac{1-\sqrt{5}}{2} \leq x \leq \frac{1+\sqrt{5}}{2}$$

≈ -0.6 ≈ 1.1

3. (a) For what value(s) of k is the inequation $x^2 + 2kx - k > 0$ true for all values of x?

(b) For what value(s) of k is the inequation $x^2 - kx + 2 \geq 0$ true for all values of x?

(c) For what value(s) of n is the inequation $x^2 + 2x \geq 2n$ true for all values of x?

a) all values of the parabola >0 (above the x-axis: ∪

so: $b^2 - 4ac < 0$

$(2k)^2 - 4(1)(-k) < 0$

$4k^2 + 4k < 0$

$4k(k+1) < 0$

⋮

b) parabola above x-axis or touching:

$b^2 - 4ac \leq 0$

c) $x^2 + 2x - 2n \geq 0$

parabola above or touching

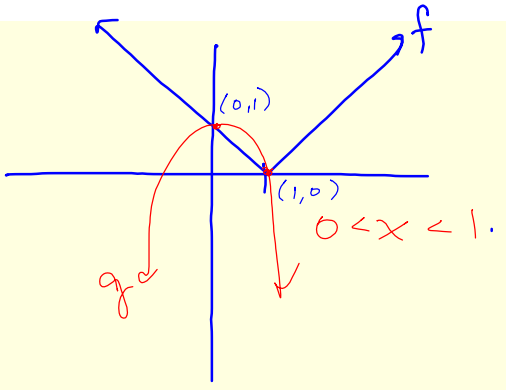
$b^2 - 4ac \leq 0$

correct answer:

$-2\sqrt{2} \leq k \leq 2\sqrt{2}$

5. On the same set of axes sketch the graphs of $f(x) = |x-1|$ and $g(x) = 1-x^2$. $-x^2+1$
Hence find $\{x : |x-1| < 1-x^2\}$.

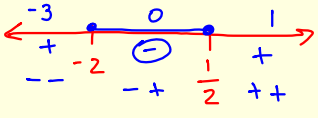
Where is the absolute value graph lower (less) than the parabola.



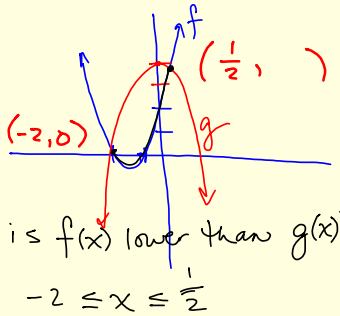
6. Given that $f(x) = x^2+3x+2$ and $g(x) = 4-x^2$, find $\{x \mid f(x) \le g(x)\}$.

$0 = (x+2)(x+1)$
x-int: $(-2,0)$ $(-1,0)$

$x^2+3x+2 \le 4-x^2$
$2x^2+3x-2 \le 0$
$(2x-1)(x+2) \le 0$



$-2 \le x \le \frac{1}{2}$

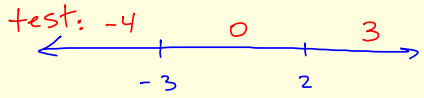


where is $f(x)$ lower than $g(x)$?
$-2 \le x \le \frac{1}{2}$

8. Find (a) $\left\{x : \frac{x-2}{x+3} > 0\right\}$

critical #'s: 2 & -3

test: -4, 0, 3



looking for where we get positive outcomes.

Solving systems with a mix of functions. (without graphers)

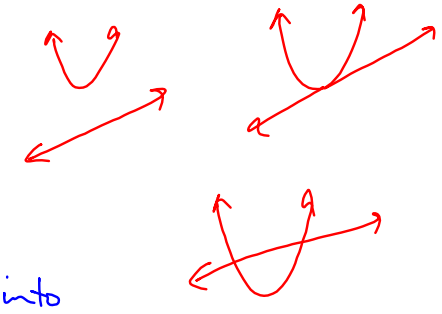
Substitution is usually the best method.

Example:

How many solutions COULD there be?

$y = x^2 + 3x - 6$

$y = 2x - 4$



$x^2 + 3x - 6 = 2x - 4$

$x^2 + x - 2 = 0$

$(x + 2)(x - 1) = 0$

$(-2, \quad)$

$(1, \quad)$

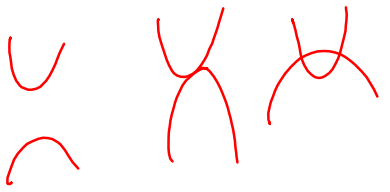
} plug these into $y = 2x - 4$ to find corresponding y's

Example: (quadratic with quadratic)

How many solutions COULD there be?

$y = 2x^2 + 3x + 1$

$y = 2x - x^2 + 3$



$2x^2 + 3x + 1 = -x^2 + 2x + 3$

$3x^2 + x - 2 = 0$

$(3x - 2)(x + 1) = 0$

$\left(\frac{2}{3}, \quad\right)$

$(-1, \quad)$

Find the value(s) of m for which the line $y = mx - 2$ is tangent to the parabola with equation $y = x^2 - 3x + 7$

Find the value(s) of m for which the line $y = mx - 2$ is tangent to the parabola with equation $y = x^2 - 3x + 7$

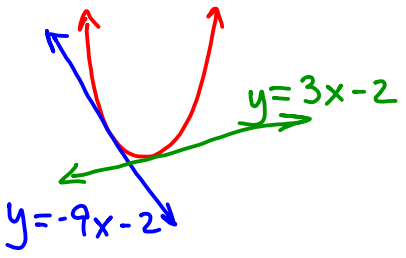
$x^2 - 3x + 7 = mx - 2$

$x^2 - 3x - mx + 9 = 0$

$x^2 + (-3 - m)x + 9 = 0$

$b^2 - 4ac = 0$

$(-3-m)^2 - 4(1)(9) = 0$



We'd like the system to have just one solution.
By substitution we have

$b^2 - 4ac = 0$

$x^2 - 3x + 7 = mx - 2$

$x^2 - 3x - mx + 9 = 0$

$x^2 + (-3 - m)x + 9 = 0$

We don't care WHAT the solution is, only that there is ONE solution. (x, y)

so that the line will be tangent.

$b^2 - 4ac = 0$

$(-3 - m)^2 - 4(1)(9) = 0$

$9 + 6m + m^2 - 36 = 0$

$m^2 + 6m - 27 = 0$

$(m + 9)(m - 3) = 0$

$m = -9$ or 3

These are the slopes for the two possible tangent lines.

What if, instead of being tangent, we want the line to intersect in two places? Never intersect with the parabola?

Start by setting the line = to the parabola,

then get the result into standard form.

$ax^2 + bx + c = 0$

$b^2 - 4ac > 0$ means that the line intersects the parabola twice

$b^2 - 4ac = 0$ means that the line touches (tangent) the parabola once

$b^2 - 4ac < 0$ means that the line never crosses the parabola

HW: SL book: p. 57

#1 aj, 2 ad, 3 - 5, 7

Bring PC book tomorrow.

HW Quiz tomorrow:
from SL Book, p. 32, p. 37, p. 43, p. 49, p. 54